CDR DEVELOPMENT PROJECT

Creating A Microwave-Based Upper-Tropospheric Humidity (UTH) FCDR

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CDR Team Meeting
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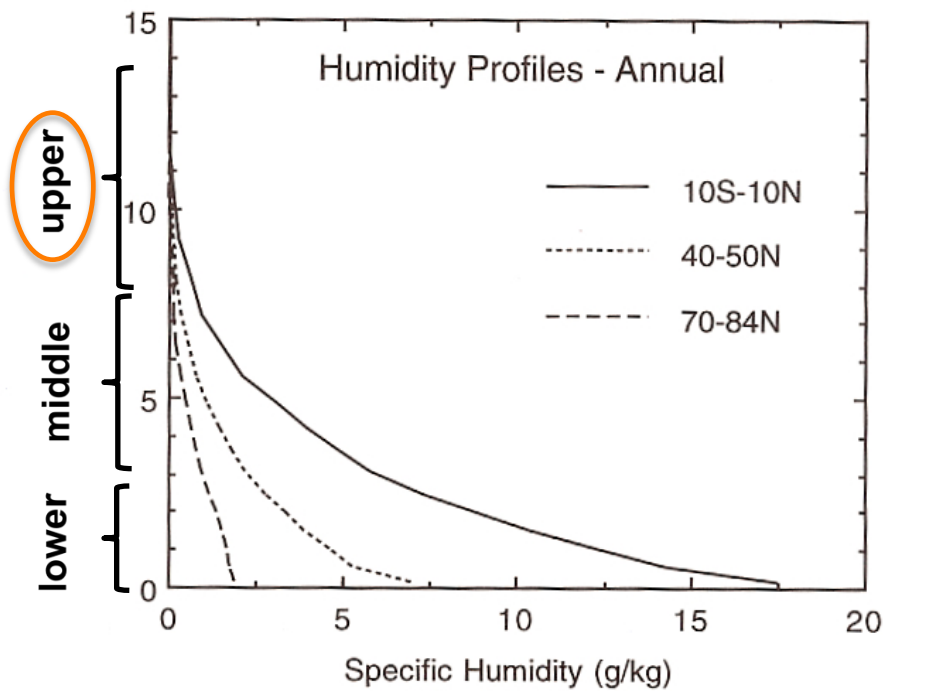
Outline

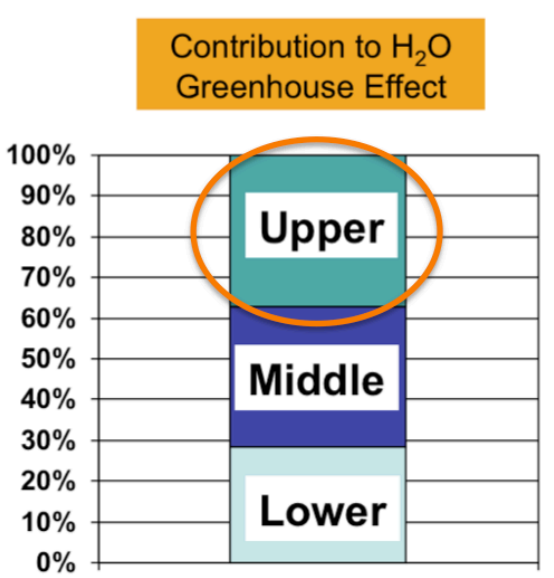
- Project Description
- Production and QA Approach
- Applications
- Schedule & Issues

Project Description

- Goal: "…bring together all the upper-tropospheric humidity (***UTH)-related radiance*** data from multiple satellites and process them to establish a long-term, global, inter-calibrated radiance record from which UTH can be retrieved and UTH research can be conducted."

Why UTH?





Despite the small amount, UTH contributes significantly to the greenhouse effect of H_2O

Project Description

- Goal: "…bring together all the ***UTH-related radiance*** data from multiple satellites and process them to establish a long-term, global, inter-calibrated radiance record from which UTH can be retrieved and UTH research can be conducted."

- Source Data for long-term UTH measurements
  1. HIRS ch12 (6.7 μm) ← Already an operational FCDR (Shi et al. 2011)
  2. Geostationary UTH channel (6.3-6.5 μm)
  3. SSM/T2, AMSU-B, … (~183 GHz) ← Focus of this project
  4. *MOZAIC (Measurement of ozone and water vapour by Airbus in-service aircraft)* ← One of the calibration bases

Project Description

CDR(s) (Validated Outputs)	Period of Record	Spatial Resolution; Projection information	Time Step	Data format	Inputs	Uncertainty Estimates (in percent or error)	Collateral Products (unofficial and/or unvalidated)
SSM/T2 UTH	1992 – 2008	~ 48 km at nadir		netCDF	Raw binary files from NOAA		Collocated ISCCP cloud info
AMSU-B UTH	2000 - present	~ 16 km at nadir		netCDF	The same as above		The same as above

Production Approach

(Use SSM/T2 as an example;
we are working on AMSU-B)

Uncalibrated, raw SSM/T2 data
(Two versions: one from NESDIS
and the other from NGDC)

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Granularize and quality control

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Apply various calibration methods

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Append ISCCP cloud info

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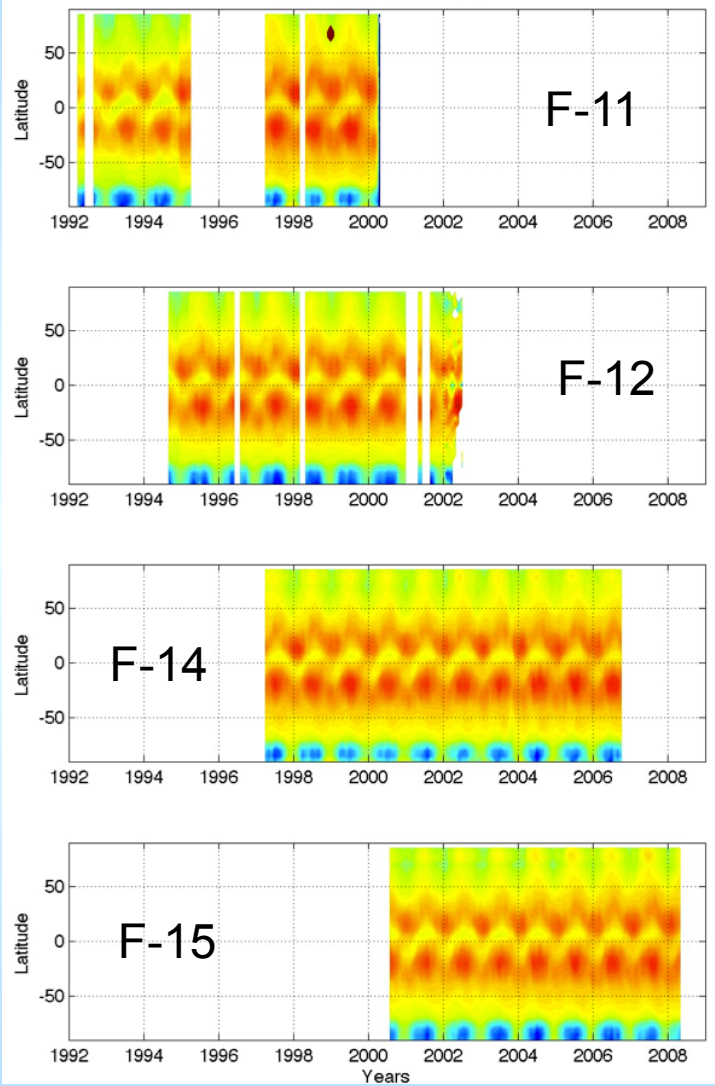
UTH FCDR

SSM/T2 TB(183±1 GHz),
monthly, zonal means



Production Approach

(Use SSM/T2 as an example;
we are working on AMSU-B)

Various Calibration Methods:

Method 1: simultaneous nadir overpass (SNO)

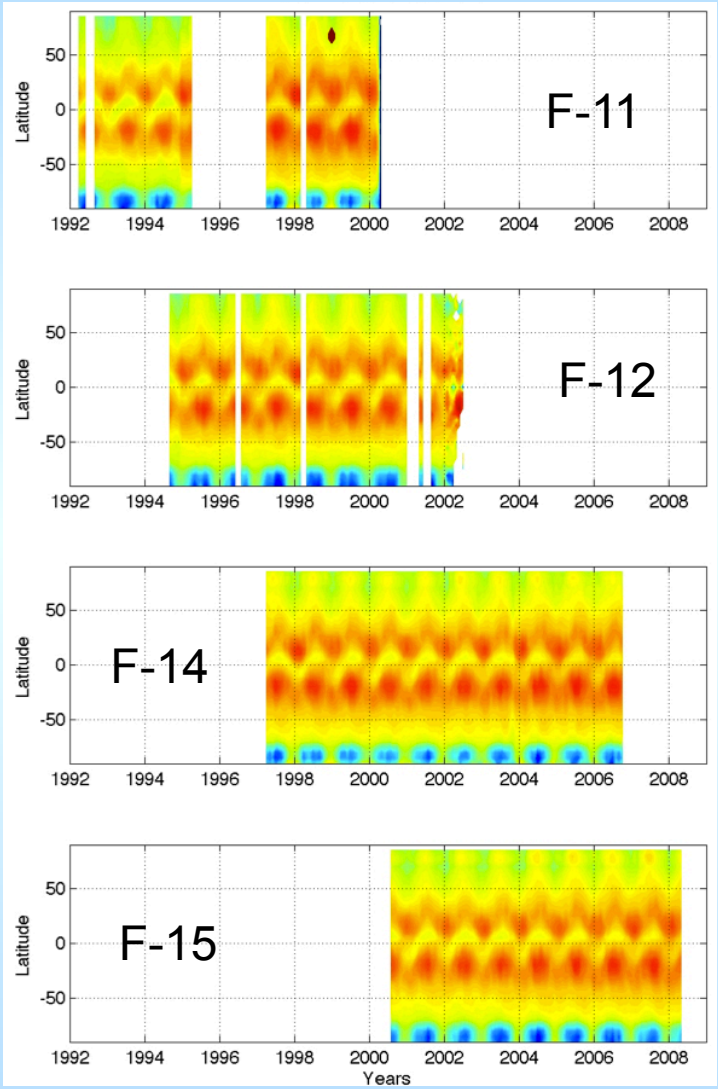
Method 2: Compare with simulated TBs based on collocated MOZAIC take-off & landing profiles

Method 3: Compare monthly/zonal means for the overlapping periods

Method 4: Use natural targets (e.g., Antarctica and tropical ocean) for inter-comparison

Goal: seek consistency among different calibration methods

SSM/T2 TB(183±1 GHz),
monthly, zonal means

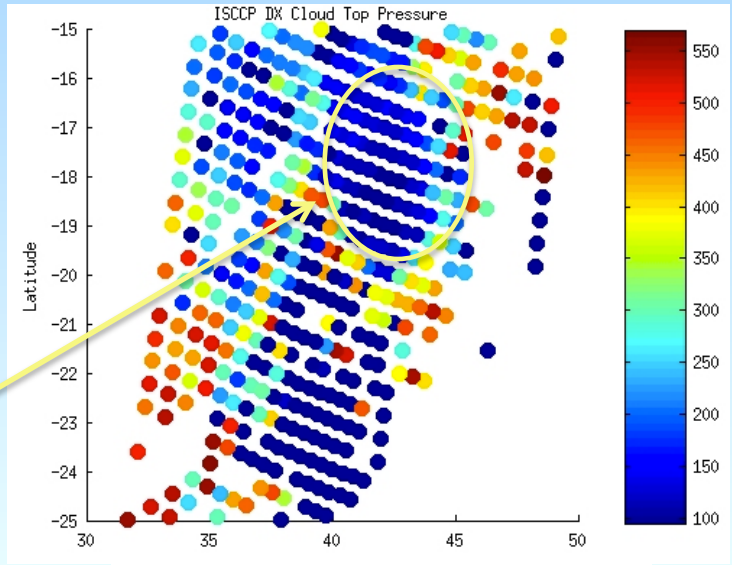


Production Approach

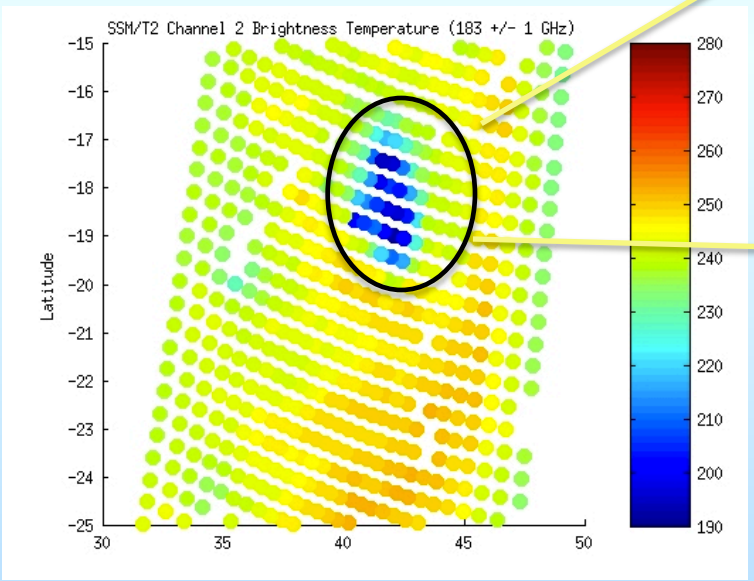
(Use SSM/T2 as an example;
we are working on AMSU-B)

An important ancillary data for UTH is clouds, because certain clouds (e.g. deep convection) can contaminate UTH radiances and need to be marked up.

ISCCP Cloud-top pressure

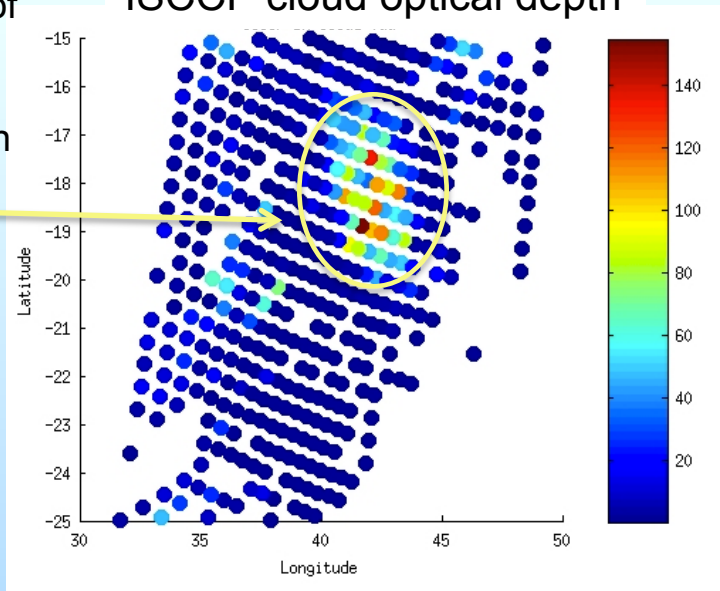


SSM/T2 TB(183±1 GHz) swath data



An example of deep convection contamination

ISCCP cloud optical depth



Quality Assurance Approach

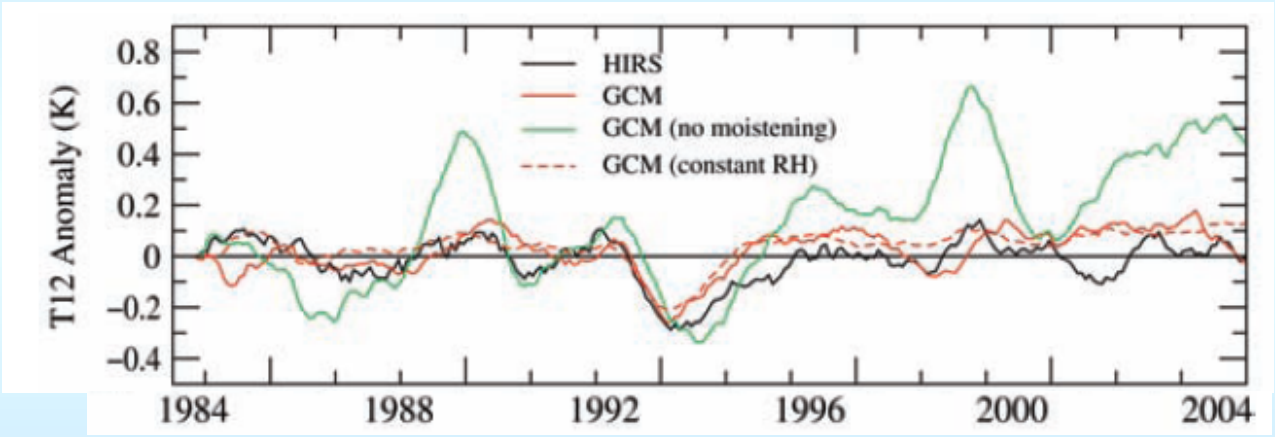
Ways to determine product quality for future data

1. Compare TB histogram against long term statistics

2. Compare with simulated TBs using collocated MOZAIC profiles

Applications

Because UTH contributes to ~ 1/3 of the H_2O greenhouse effect, it will help better monitor and understand global warming to have a reliable long-term UTH CDR. MW-based UTH measurements have the advantage of being less sensitive to clouds.



Soden et al. (2005), Science.

HIRS Ch12 is an IR UTH channel, which is easily contaminated by high-level clouds. We will supplement it with an MW-based UTH record (which is less affected by clouds).

Schedule & Issues

(**Year 1: 2010-2011**)

1. Explored various methods to calibration SSM/T2;
2. Started the effort of re-archiving SSM/T2 data.

(**Year 2: 2011-2012**)

1. Continue the effort to re-archive SSM/T2 (thanks to Hilawe Semunegus of NCDC and Dan Kowal of NGDC)
2. Append SSM/T2 with ISCCP cloud info

(**Year 3: 2012-2013)**

1. Compare various calibration results and consolidate them
2. Preliminary comparison between SSM/T2 and AMSU-B (1 yr of data)

(No-cost extension: 2013-2014)

1. Finish calibration of AMSU-B and SSM/T2
2. Bring in IR UTH data from GEOs;
3. Package up the UTH CDR and deliver it to NCDC.